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EXAMINER	
HARPER, V PAUL	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/896,836	LEYSIEFFER ET AL.	
	Examiner	Art Unit	
	V. Paul Harper	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-20 and 77-95* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9-20 and 77-95* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-4, 6, 7, 9, 10, 13, 14, 17, 19, 20, 78, 82, and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels et al. (US Patent 6,047,074), hereinafter referred to as Zoels, in view of von Ilberg (U.S. Patent 6,231,604), hereinafter referred to as von Ilberg in view of Leonhard (U.S. Patent 5,884,260), hereinafter referred to as Leonhard, and Boss et al. (U.S. Patent 5,933,805), hereinafter referred to as Boss.

Regarding **claim 1**, Zoels discloses a programmable hearing aid, which includes the following features:

- at least one acoustic sensor configured to sense an acoustic signal and to convert said acoustic signal into an electrical audio signal (Fig. 1 items 2 and 4, col. 2, lines 1-6);
- an electronic signal processing unit configured to amplify said electrical audio signal (Fig. 1, items 6 and 7, col. 2, lines 1-6),

Zoels teaches the use of an electroacoustical output transducer (col. 1, lines 9-11), but Zoels does not specifically disclose "an actuator arrangement configured to provide output stimulation and configured to be positioned in a single external auditory passage, comprising at least dual output stimulators consisting of, at least one intracochlear electromechanical or purely electric stimulator, and at least an additional extracochlear electroacoustic, electromechanical, or purely electric stimulator." However, the examiner contends that this concept was well known in the art, as taught by von Ilberg

In the same field of endeavor, von Ilberg discloses a method for combined acoustic mechanical and electrical auditory stimulation that includes 1 or 2 electrodes for intra-cochlear placement (Fig. 1, item 17, col. 5, lines 25-47, a combination device including an acoustic mechanical component ... and electrodes; col. 1, line 57 through col. 2, line 7).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing the transducer configuration, as taught by von Ilberg, because it is well known in the art at the time of invention as having advantages for patients who are moderately hearing impaired (col. 3, lines 25-40) and further, of extending the range of use of Zoels' invention to include individuals with borderline deafness.

In addition, Zoels' invention includes a programmable processor, but Zoels does not specifically disclose, "said signal processing unit comprising, a speech analysis and recognition module configured, ... a speech synthesis module configured to facilitate

transmission of said speech information in a noisy environment from said audio signal". However, the examiner contends that these features were well known in the art, as taught by Leonhard.

In the same field of endeavor, Leonhard discloses a system for detecting and generating transient conditions in auditory signals. Leonhard's system performs signal analysis, recognition and synthesis (Figs. 8, 19, abstract, col. 1, lines 5-20; col. 15, lines 16-25), and Leonhard further teaches that the invention may be used to in hearing aids to improve noise suppression in speech signals (col. 15, lines 30-34).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing the algorithmic features, as taught by Leonhard, for the purpose of improving the quality of the speech signal generated (Leonhard, col. 15, lines 30-34).

Furthermore, Zoels does not specifically teach "said speech analysis and recognition module are configured to detect and extract additional prosody of speech information from said audio signal, and ... based on the prosody of said speech information." However, the examiner contends that this concept was well known in the art, as taught by Boss.

In the same field of endeavor, Boss discloses a system for retaining prosody during speech analysis for later playback. Boss's system includes a speech analyzer for detecting phonemes and a synthesizer for playback (abstract, Fig. 4 item 48, Fig. 5 item 98, col. 2, line 61 through col. 3, line 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard by specifically providing the features, as taught by Boss, since it is well known in the art for the purpose of improving the quality of the synthesized speech for hearing impaired individuals (Quagliaro, U.S. Patent 6,408,273, col. 3, lines 10-16).

Regarding **claim 2**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1). As stated above, Boss and Leonhard teach recognition, but Zoels does not specifically teach "the signal processing unit has a digital signal processor having software modules for speech analysis and recognition module and said synthesis." However, the examiner contends that these concepts were well known in the art, as taught by Leonhard.

Leonhard's system further performs signal analysis and synthesis within a signal processor (Figs. 8, 19, abstract, col. 1, lines 5-20, col. 15, lines 49-54), the processor necessarily containing software modules.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing algorithmic features, as taught by Leonhard, for the purpose adhering to standard modular software design practices.

Regarding **claim 3**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 2). Furthermore, Zoels indicates that

the programmability of the hearing aid offers possible adaptability by replacement of the program (col. 2, lines 20-25), and as Leonard teaches (see rejections of claims 1 and 2, above), the analysis, recognition, and synthesis programs are software modules (hence replaceable), which corresponds to "the speech analysis and recognition module and said speech synthesis module are adaptive."

Regarding **claim 4**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 2). Furthermore, Zoels indicates that the programmability of the hearing aid offers possible replacement of the program (col. 2, lines 20-25), and as Leonard teaches (see rejections of claims 1 and 2, above), the analysis, recognition, and synthesis programs are software modules (hence replaceable or re-programmable), which corresponds to "said speech analysis and recognition module and said speech synthesis module are re-programmable.

Regarding **claim 6**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1), but Zoels does not specifically teach "said speech analysis and recognition module and said speech synthesis module are adapted to transmit phonetic categories between said modules." However, the examiner contends that this concept was well known in the art, as taught by Leonhard.

Leonhard further discloses that during analysis, recognition and synthesis, signal corresponding to phonemes are used (col. 11, lines 1-9, col. 13, lines 14-26, col. 15, lines 17-24, Figs. 8 and 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard by specifically using signal representing phonemes, as taught by Leonhard, since phonetic representation can be used during both recognition and synthesis.

Regarding **claim 7**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1), but Zoels does not specifically teach "said speech analysis and recognition module and said speech synthesis module are adapted to transmit lexical categories between said modules." However, the examiner contends that this concept was well known in the art, as taught by Leonhard.

Leonhard further discloses that during analysis, recognition and synthesis, a word/sentence determination can be made (col. 13, lines 14-26, Fig. 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard by specifically providing the use of lexical categories, as taught by Leonhard, since lexical categories can improve accuracy during recognition and can also be useful during synthesis.

Regarding **claim 9**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1), but Zoels in view of Leonhard do not specifically teach "said speech analysis and recognition module is configured to detect and extract level and characteristic of fundamental speech frequency for voiced sounds, and wherein said speech synthesis module is configured to take into account

prosody of speech information in speech synthesis and is adapted to effect the corresponding modulation of a generated output signal." However, the examiner contends that this concept was well known in the art, as taught by Boss.

Boss further teaches that during the extraction of the prosodic features, pitch (fundamental frequency), duration and amplitude (level) are detected and that these parameters are encoded and used during synthesis (Fig. 4 items 56, 58, and 60; col. 3, lines 5-19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard by specifically providing the features, as taught by Boss, to more accurately reproduce the prosodic features of the analyzed speech.

Regarding **claim 10**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1). In addition, Zoels teaches that the signal processing (used in Zoels specifically for tinnitus treatment, and in Zoels in view of Leonhard for analysis and synthesis) can be enabled and disabled (col. 5, lines 19-44), which corresponds to "said speech analysis and recognition module and said speech synthesis module are adapted to be turned off to enable processing of audio signals without speech analysis and synthesis."

Regarding **claim 13**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1). Furthermore, Zoels teaches that

the hearing aid system can be used for tinnitus therapy (i.e., programmed for the masking of the tinnitus) (col. 1, line 64 through col. 2, line 55) and Boss teaches the use of a synthesizer (see rejection of claim 1), which corresponds to "said signal processing unit further includes modules adapted to enable masking of tinnitus parallel to operation of speech synthesis."

Regarding **claim 14**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1). In addition, Zoels teaches the use of an amplifier and a signal converter (necessarily including an A/D converter) before the signal processor (Fig. 1 items 6, 4), which corresponds to "said signal processing unit includes, a preprocessing arrangement for at least one of pre-amplification and filtering, and an A/D converter for analog-digital (A/D) conversion of the acoustic signals."

Regarding **claim 17**, Zoels in view of Leonhard teach everything claimed, as applied above (see claim 1); in addition, Zoels teaches the use of a signal converter (necessarily including a D/A converter) feeding an output transducer (Fig. 1, col. 2, lines 1-10), which corresponds to "at least one digital-analog converter is connected upstream of the actuator arrangement."

Regarding **claims 19 and 20**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 17); furthermore, Zoels teaches

the use of a digital hearing aid (with a signal converter and a signal processor) that can be employed for tinnitus masking (abstract, col. 2, lines 1-35), which corresponds to "the signal processing unit further comprises a digital signal processor configured to process A/D-converted acoustic sensor signals, wherein said signals have been preprocessed by means of said preprocessing arrangement and configured to generate digital signals for tinnitus masking."

Regarding **claim 78**, Zoels in view of von Ilberg and Leonhard teaches everything claimed, as applied above (see claim 77). But Zoels does not specifically teach "said signal processing unit is further configured to extract prosody of speech information from said audio signal, and wherein said artificial speech signal conveys said prosody information." However, the examiner contends that this concept was well known in the art, as taught by Boss.

In the same field of endeavor, Boss discloses a system for retaining prosody during speech analysis for later playback. Boss's system includes a speech analyzer for detecting phonemes and a synthesizer for playback (abstract, Fig. 4 item 48, Fig. 5 item 98, col. 2, line 61 through col. 3, line 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard and von Ilberg by specifically providing the features, as taught by Boss, since it is well known in the art for the purpose of improving the quality of the synthesized speech for hearing impaired individuals (Quagliaro, U.S. Patent 6,408,273, col. 3, lines 10-16).

Regarding **claim 82**, Zoels in view of Leonhard and von Ilberg teaches everything claimed, as applied above (see claim 77). But Zoels does not specifically teach "said signal processing unit is further configured to convert said audio signal into a purely artificial speech signal." However, the examiner contends that this concept was well known in the art, as taught by Boss.

In the same field of endeavor, Boss discloses a system for retaining prosody during speech analysis for later playback. Boss's system includes a speech analyzer for detecting phonemes and a synthesizer for playback (abstract, Fig. 4 item 48, Fig. 5 item 98, col. 2, line 61 through col. 3, line 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard and von Ilberg by specifically providing the features, as taught by Boss, since it is well known in the art for the purpose of improving the quality of the resulting synthesized speech for hearing impaired individuals (Quagliaro, U.S. Patent 6,408,273, col. 3, lines 10-16).

Regarding **claim 85**, Zoels in view of Leonhard and von Ilberg teaches everything claimed, as applied above (see claim 77). In addition, Zoels teaches that the hearing aid can be used for tinnitus treatment (title, abstract), but Zoels does not specifically teach "said signal processing unit is further configured to perform tinnitus masking simultaneously with said speech analysis and synthesis." However, the examiner contends that this concept was well known in the art, as taught by Boss.

In the same field of endeavor, Boss discloses a system for retaining prosody during speech analysis for later playback. Boss's system includes a speech analyzer for detecting phonemes and a synthesizer for playback (abstract, Fig. 4 item 48, Fig. 5 item 98, col. 2, line 61 through col. 3, line 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard and von Ilberg by specifically providing the features, as taught by Boss, since it is well known in the art for the purpose of improving the quality of the resulting synthesized speech for hearing impaired individuals (Quagliaro, U.S. Patent 6,408,273, col. 3, lines 10-16).

2. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of von Ilberg, Leonhard and Boss as applied to claim 1 above, and further in view of Markowitz (*Using Speech Recognition*, Prentice Hall, 1996), hereinafter referred to as Markowitz.

Regarding **claim 5**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1), but Zoels in view of Leonhard do not specifically teach "said speech analysis and speech recognition module and said speech synthesis module include a digitally implemented neural network." However, the examiner contends that this concept was well known in the art, as taught by Markowitz.

In the same field of endeavor, Markowitz teaches the techniques for using and implementing speech recognition. In addition, Markowitz teaches the use of neural networks for speech recognition (p. 44, §2.5.1 "Neural Networks for Speech Recognition," p. 46, §2.5.7 "Neural Networks for Speech Coding").

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard by specifically providing the neural network techniques for speech recognition, as taught by Markowitz, for the superior classification techniques resulting from the use of neural networks.

3. Claims 11, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of von Ilberg, Leonhard and Boss as applied to claim 10 above, and further in view of well known prior art (MPEP 2144.03).

Regarding **claim 11**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 10); in addition, Zoels teaches an automatic change in the control elements (in this case, a change in the generated signals for tinnitus therapy) (col. 5, lines 20-44), which corresponds to "configured to automatically turn off said speech analysis and recognition module and said speech synthesis module [signal processing modules] ...". But Zoels in view of Leonhard does not teach that the switching occurs "at a low level of interfering sound." However, the examiner takes official notice of the fact that the automatic switching of noise-reducing signal processing software was well known in the art.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the control function of Zoels in view of Leonhard such that automatic switching could be used, making the operation of the unit more convenient for the user.

Regarding **claim 12**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 10); in addition, Zoels teaches that the signal processing can be controlled by a control element (Fig. 4 item 17, col. 5, lines 20-44), which corresponds to "configured to turn off said speech analysis and recognition module and said speech synthesis module ...". But Zoels in view of Leonhard do not specifically teach that the means is "...by remote control." However, the examiner takes official notice of the fact that the use of a remote control for the purpose of controlling the operation of a hearing aid was well known in the art.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the control function of Zoels in view of Leonhard such that a remote control could be used, making the operation of the unit more convenient for the user.

Regarding **claim 15**, Zoels in view of Leonhard teach everything claimed, as applied above (see claim 14), including the use of a signal converter (Zoels, Fig. 1 item 14), but Zoels in view of Leonhard do not specifically teach "said preprocessing arrangement comprises an anti-aliasing filter." However, the examiner takes official

notice of the fact that the use of an anti-aliasing filter before an analog to digital conversion for the purpose of reducing aliasing was well known in the art.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard to include an anti-aliasing filter, to improve the quality of the signal processing.

4. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of von Ilberg, Leonhard and Boss as applied to claim 1 above, and further in view of Magotra et al. (US Patent 5,608,803), hereinafter referred to as Magotra.

Regarding **claim 16**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1). In addition, Zoels teaches the use of a microphone connected to a signal converter (Fig. 1, items 6, 4), but Zoels in view of Leonhard do not specifically teach, "a plurality of acoustic sensors, wherein said acoustic sensors are configured to be upstream of an analog-digital converter." However, the examiner contends that this concept was well known in the art, as taught by Magotra.

In the same field of endeavor, Magotra discloses a programmable digital hearing aid where the outputs of two microphones are feed into A/D converters (Fig. 1, items 10, 1, col. 3, lns 35-50).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard by specifically providing multiple acoustic inputs, as taught by Magotra, for the purpose of improved filtering capabilities.

Regarding **claim 18**, Zoels in view of von Ilberg, Leonhard and Boss teach everything claimed, as applied above (see claim 1). In addition, Zoels teaches the use of an output transducer connected to a signal converter (Fig. 1, items 5, 4), but Zoels in view of Leonhard do not specifically teach that "said actuator arrangement comprises a plurality of actuators, and wherein a respective digital-analog converter is connected upstream of each actuator." However, the examiner contends that this concept was well known in the art, as taught by Magotra.

In the same field of endeavor, Magotra discloses a programmable digital hearing aid where stereo outputs feed earphones (Fig. 1, items 8, 11, 13; col. 3, lines 40-65).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard by specifically providing multiple acoustic outputs, as taught by Magotra, so that stereo output can be supported.

5. Claims 77, 79, 80, 81 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of von Ilberg and Leonhard.

Regarding **claim 77**, Zoels discloses a programmable hearing aid, which includes the following features:

- at least one acoustic sensor configured to convert a sensed acoustical signal into an electrical audio signal (Fig. 1 items 2 and 4, col. 2, lines 1-6);

In addition, Zoels' invention includes a programmable processor, but Zoels does not specifically disclose, "a signal processing unit configured to analyze said audio signal and to synthesize said audio signal to generate an artificial speech signal having approximately no input-side interference". However, the examiner contends that these features were well known in the art, as taught by Leonhard.

In the same field of endeavor, Leonhard discloses a system for detecting and generating transient conditions in auditory signals. Leonhard's system performs signal analysis, recognition and synthesis (Figs. 8, 19, abstract, col. 1, lines 5-20; col. 15, lines 16-25), and Leonhard further teaches that the invention may be used to in hearing aids to improve noise suppression in speech signals (i.e., produced signal having essentially no input-side interference)(col. 15, lines 30-34).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing that algorithmic features, as taught by Leonhard, for the purpose of improving the quality of the speech signal generated (Leonhard, col. 15, lines 30-34).

Zoels teaches the use of an electroacoustical output transducer (col. 1, lines 9-11), but Zoels does not specifically disclose "an actuator arrangement, configured to provide output stimulation based on said artificial speech signal, comprising at least

dual output stimulators, consisting of at least one intracochlear electromechanical or purely electric stimulator, and said at least an additional extracochlear electroacoustic, electromechanical, or purely electric stimulator." However, the examiner contends that this concept was well known in the art, as taught by von Ilberg

In the same field of endeavor, von Ilberg discloses a method for combined acoustic mechanical and electrical auditory stimulation that includes 1 or 2 electrodes for intra-cochlear placement (Fig. 1, item 17, col. 5, lines 33-47, a combination device including an acoustic mechanical component ... and electrodes; col. 1, lines 57-67).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing the transducer configuration, as taught by von Ilberg, because it is well known in the art at the time of invention as having advantages for patients who are moderately hearing impaired (col. 3, lines 25-40) and further, of extending the range of use of Zoels' invention to include individuals with borderline deafness.

Regarding **claim 79**, Zoels in view of Leonhard and von Ilberg teaches everything claimed, as applied above (see claim 77). In addition, Leonhard teaches "said signal processing unit is further configured to analyze said audio signal by performing speech segmentation or recognition" (Figs. 8, 19, abstract, col. 1, lines 5-20; col. 15, lines 16-25).

Regarding **claim 80**, Zoels in view of Leonhard and von Ilberg teaches everything claimed, as applied above (see claim 77). In addition, Leonhard teaches, "said signal processing unit comprises: software modules configured to analyze said audio signal and to convert said audio signal into said artificial speech signal" (Figs. 8, 19, abstract, col. 1, lines 5-20, col. 15, lines 49-54; the processor necessarily containing software modules).

Regarding **claim 81**, Zoels in view of Leonhard and von Ilberg teaches everything claimed, as applied above (see claim 80). In addition, Zoels teaches "said software modules are reprogrammable" (title of "programmable hearing aid ...").

Regarding **claim 84**, Zoels in view of Leonhard and von Ilberg teaches everything claimed, as applied above (see claim 77). In addition, Zoels teaches "said signal processing unit is further configured to transmit said audio signals to said actuator arrangement without performing said speech analysis and synthesis, and wherein said actuator arrangement is configured to provide output stimulation based on said transmitted audio signals" (col. 5, lines 19-44; control elements are included ...).

6. Claim 83 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of von Ilberg and Leonhard, and further in view of Markowitz.

Regarding **claim 83**, Zoels in view of von Ilberg and Leonhard teaches everything claimed, as applied above (see claim 77). In addition, Zoels' invention includes a programmable processor performing modification and analysis (Fig. 2) with necessary software and algorithmic components, and Leonhard teahes that during analysis and recognition a word/sentence determination can be made (col. 13, lines 14-26, Fig. 19, i.e. lexical categories), but Zoels does not specifically disclose "said signal processing unit includes a digitally implemented neural network configured to assign said audio signal to phonetic or lexical categories with automatic algorithms prior to synthesis. However, the examiner contends that this concept was well known in the art, as taught by Markowitz.

In the same field of endeavor, Markowitz teaches the techniques for using and implementing speech recognition. In addition, Markowitz teaches the use of neural networks for speech recognition and coding (p. 44, §2.5.1 "Neural Networks for Speech Recognition," p. 46, §2.5.7 "Neural Networks for Speech Coding").

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing the neural network techniques, as taught by Markowitz, for the superior classification techniques resulting from the use of neural networks (Markowitz, p. 44, ¶3).

7. Claims 86, 88-90, 92, and 93 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of Leonhard and Markowitz.

Regarding **claim 86**, Zoels discloses a programmable hearing aid, which includes the following features:

- at least one acoustic sensor configured to convert a sensed acoustical signal into an electrical audio signal (Fig. 1 items 2 and 4, col. 2, lines 1-6);
- a signal processor configured to process and amplify said electrical audio signal (Fig. 1, item 7, col. 2, lines 1-6),
- an actuator arrangement configured to provide output stimulation based on said artificial speech signal (Fig. 1, item 5, output transducer).

In addition, Zoels' invention includes a programmable processor performing modification and analysis (Fig. 2) with necessary software and algorithmic components, but Zoels does not specifically disclose, "a speech analysis ... having a digitally implemented **neural network** configured to analyze said audio signal with automatic algorithms." However, the examiner contends that this concept was well known in the art, as taught by Markowitz.

In the same field of endeavor, Markowitz teaches the techniques for using and implementing speech recognition. In addition, Markowitz teaches the use of neural networks for speech recognition and coding (p. 44, §2.5.1 "Neural Networks for Speech Recognition," p. 46, §2.5.7 "Neural Networks for Speech Coding").

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing the neural network techniques, as taught by Markowitz, for the superior classification techniques resulting from the use of neural networks (Markowitz, p. 44, ¶3).

Furthermore, Zoels does not specifically teach "a speech analysis and recognition module...; a speech synthesis module configured to convert said analyzed audio signals into an artificial speech signal". However, the examiner contends that these features were well known in the art, as taught by Leonhard.

In the same field of endeavor, Leonhard discloses a system for detecting and generating transient conditions in auditory signals. Leonhard's system performs signal analysis, recognition and synthesis (Figs. 8, 19, abstract, col. 1, lines 5-20; col. 15, lines 16-25), and Leonhard further teaches that the invention may be used to in hearing aids to improve noise suppression in speech signals (col. 15, lines 30-34).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing that algorithmic features, as taught by Leonhard, for the purpose of improving the quality of the speech signal generated (Leonhard, col. 15, lines 30-34).

Regarding **claim 88**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). In addition, Leonhard teaches "said speech analysis and recognition module is further configured to analyze said audio signal by performing speech segmentation or recognition" (Figs. 8, 19, abstract, col. 1, lines 5-20; col. 15, lines 16-25).

Regarding **claim 89**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). In addition, Leonhard teaches

"said speech analysis and recognition module and said speech synthesis module comprise software modules" (Figs. 8, 19, abstract, col. 1, lines 5-20, col. 15, lines 49-54; the processor necessarily containing software modules).

Regarding **claim 90**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 89). In addition, Zoels teaches "said software modules are reprogrammable" (title, "programmable hearing aid ...").

Regarding **claim 92**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). In addition, Leonhard teaches "said speech analysis and recognition module is configured to assign said audio signal to phonetic or lexical categories prior to synthesis" (col. 11, lines 1-9, col. 13, lines 14-26, col. 15, lines 17-24, Figs. 8 and 19, during analysis, recognition and synthesis, phonemes are used).

Regarding **claim 93**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). In addition, Zoels teaches "said signal processing unit is configured to turn off said speech analysis and recognition and speech synthesis modules, and to transmit said audio signals to said actuator arrangement without performing said speech analysis and synthesis, and wherein said actuator arrangement is configured to provide output stimulation based on said transmitted audio signals." (col. 5, lines 19-44, control elements are included ...).

8. Claims 87, 91, and 94 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of Leonhard and Markowitz and further in view of Boss.

Regarding **claim 87**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). But Zoels does not specifically teach "said speech analysis and recognition module is configured to extract prosody of speech information from said audio signal, and said speech synthesis module is configured to produce an artificial speech signal that conveys said prosody information." However, the examiner contends that this concept was well known in the art, as taught by Boss.

In the same field of endeavor, Boss discloses a system for retaining prosody during speech analysis for later playback. Boss's system includes a speech analyzer for detecting phonemes and a synthesizer for playback (abstract, Fig. 4 item 48, Fig. 5 item 98, col. 2, line 61 through col. 3, line 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard and Markowitz by specifically providing the features, as taught by Boss, since it is well known in the art for the purpose of improving the quality of the synthesized speech for hearing impaired individuals (Quagliaro, U.S. Patent 6,408,273, col. 3, lines 10-16).

Regarding **claim 91**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). But Zoels does not specifically teach "said speech synthesis module is configured to convert said analyzed audio signal into a purely artificial speech signal." However, the examiner contends that this concept was well known in the art, as taught by Boss.

In the same field of endeavor, Boss discloses a system for retaining prosody during speech analysis for later playback. Boss's system includes a speech analyzer for detecting phonemes and a synthesizer for playback (abstract, Fig. 4 item 48, Fig. 5 item 98, col. 2, line 61 through col. 3, line 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard and Markowitz by specifically providing the features, as taught by Boss, since it is well known in the art for the purpose of improving the quality of the resulting synthesized speech for hearing impaired individuals (Quagliaro, U.S. Patent 6,408,273, col. 3, lines 10-16).

Regarding **claim 94**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). In addition, Zoels teaches that the hearing aid can be used for tinnitus treatment (title, abstract), but Zoels does not specifically teach "said signal processing unit is further configured to perform tinnitus masking simultaneously with said speech analysis and synthesis." However, the examiner contends that this concept was well known in the art, as taught by Boss.

In the same field of endeavor, Boss discloses a system for retaining prosody during speech analysis for later playback. Boss's system includes a speech analyzer for detecting phonemes and a synthesizer for playback (abstract, Fig. 4 item 48, Fig. 5 item 98, col. 2, line 61 through col. 3, line 19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels in view of Leonhard and Markowitz by specifically providing the features, as taught by Boss, since it is well known in the art for the purpose of improving the quality of the resulting synthesized speech for hearing impaired individuals (Quagliaro, U.S. Patent 6,408,273, col. 3, lines 10-16).

9. Claim 95 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zoels in view of Leonhard and Markowitz and further in view of von Ilberg.

Regarding **claim 95**, Zoels in view of Leonhard and Markowitz teaches everything claimed, as applied above (see claim 86). In addition, Zoels teaches the use of an electroacoustical output transducer (col. 1, lines 9-11), but Zoels does not specifically disclose "said actuator arrangement comprises: at least dual output stimulators, wherein at least one stimulator is an intracochlear electromechanical or purely electric stimulator, and said at least additional stimulator is an extracochlear electroacoustic, electromechanical, or purely electric stimulator." However, the examiner contends that this concept was well known in the art, as taught by von Ilberg

In the same field of endeavor, von Ilberg discloses a method for combined acoustic mechanical and electrical auditory stimulation that includes 1 or 2 electrodes for intra-cochlear placement (Fig. 1, item 17, col. 5, lines 33-47, a combination device including an acoustic mechanical component ... and electrodes; col. 1, lines 57-67).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Zoels by specifically providing the transducer configuration, as taught by von Ilberg, because it is well known in the art at the time of invention as having advantages for patients who are moderately hearing impaired (col. 3, lines 25-40) and further, of extending the range of use of Zoels' invention to include individuals with borderline deafness.

Response to Arguments

10. Applicants' arguments filed 11/13/2006 have been fully considered but are not persuasive.

11. Applicants assert on page 9:

> 5. *Without addressing the apparent lack of motivation to combine the references as suggested by the Examiner*, Applicants assert that the above rejections are prima facie improper because the suggested combination fails to contain each and every element of Applicants' claimed invention without substantial modifications being made to the resulting combination. (Italics added)

The Examiner notes that motivations have been supplied but without more specific indications as where motivations are lacking it is difficult to address these concerns.

12. Applicants assert on page 13:

> 13. Thus, it is clear that *von Illberg teaches the use of intracochlear stimulation which absolutely and permanently prevents the use of any type of extracochlear stimulation.* (See, von illberg, col. 3, lines 26-41.) Therefore, because von Illberg prevents the use of "at least dual output stimulators, wherein said output stimulators are at least one intracochlear electromechanical or purely electric stimulator, and at least an additional extracochlear electroacoustic, electromechanical, or purely electric stimulator" as recited in Applicants' claim 1, Applicants assert that von Illberg fails to teach or suggest that which the Examiner asserts.

The Examiner would like to point out that similar arguments were previously presented, and addressed in the Office Action dated 7/12/06 (¶ 8), and that the portion of von Ilberg referred to in that discussion (col. 5, lines 25-48) was not addressed in the most recent arguments.

Von Ilberg states that "this technique [intracochlear placement] is not used when there is significant residual hearing" (col. 1, lines 53-55). In other words, this technique can be used when there is less than a significant amount of residual hearing. Von Ilberg then goes on to describe an electrical stimulation module (delivering one subrange of frequencies) and an acoustic mechanical stimulation module (delivering a second subrange of frequencies) (col. 1, line 57 through col. 2, line 7). Additionally, von Ilberg discloses (col. 5, lines 25-48) "[t]he combination device of a preferred embodiment that includes an acoustic mechanical component similar to that found in

prior art hearing aids; and an electrical component for electrical stimulation of the of the cochlea, ... and electrodes. " Von Ilberg goes on to say that these electrodes can be used for shallow **intra-cochlear** placement. Also, von Ilberg states "[i]n other embodiments, the simulation electrodes 17 may be **inserted partially or fully into the cochlea** ..." (col. 4, line 67 through col. 5). Furthermore, von Ilberg states an "acoustic mechanical stimulation component **and**/or the electrical stimulation component ..." can be packaged separately or together (col. 5, lines 46-49) where here it would be reasonable to assume that since both components are included together they would both be used (i.e., both mechanical and electrical stimulation, where as previously indicated by von Ilberg the electrical stimulation can be **intracochlear**).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to V. Paul Harper whose telephone number is (571) 272-7605. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

12/07/2006

V. Paul Harper
Patent Examiner
Art Unit 2626